0061886

Department of Energy

Richland Operations Office
P.O. Box 550
Richland, Washington 99352

04-AMCP-0298

JUN 4 2004

Mr. Nicholas Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352

Dear Mr. Ceto:

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) TIME CRITICAL REMOVAL ACTION MEMORANDUM FOR TREATMENT AND DISPOSAL OF SLUDGE FROM THE 105 K EAST BASIN NORTH LOADOUT PIT

Attached for the U.S. Environmental Protection Agency's signature is a Time-Critical Removal Action (TCRA) Memorandum for the treatment and disposal of sludge from the 105 K East North Loadout Pit. The TCRA will allow the U.S. Department of Energy, Richland Operations Office to remove and treat K Basin sludge using currently available technologies, while pursuing a revision to the Record of Decision (ROD).

If there are any questions, please contact me, or your staff may contact Matt McCormick, Assistant Manager for the Central Plateau, on (509) 373-9971, or Joel Hebdon, Director, Office of Environmental Services, on (509) 376-6657, for regulatory issues.

Sincerely,

Keith A. Klein
Manager

AMCP:JWT

Attachment

cc w/attach:
L. E. Gadbois, EPA
J. S. Hertzel, FHI
S. M. Sax, WSMS
Administrative Record
Environmental Portal

ACTION MEMORANDUM

DATE: May 25, 2004

SUBJECT: Request for Time Critical Response for Treatment and Disposal of Sludge from the 105-K East North Loadout Pit, USDOE Hanford Site

I. PURPOSE

The purpose of this Action Memorandum is to document approval of a Time Critical Removal Action (TCRA) described herein for treatment and disposal of sludge from the 105-K East Basin North Loadout Pit (NLOP) located at the 100-KR-2 Operable Unit at the Hanford Site, Benton County, Washington (See Figure 1).

There is an existing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) interim action Record of Decision (ROD) issued April 1999 (EPA/541/R-99/059) that directs the removal and transport of the sludge from the K Basins to Hanford's 200 Area where it would await future treatment. This TCRA requires the sludge from the NLOP to be treated to make the sludge safer to temporarily store at Hanford rather than be placed into extended storage in its current less stable form. This TCRA authorizes temporary storage of the treated sludge at Hanford, and disposal of the treated sludge at the Waste Isolation Pilot Plant (WIPP) in New Mexico.

This action reduces the potential risks for environmental impacts associated with extended storage as untreated sludge and the additional handling resulting from that storage. Sludge retrieval will be followed by treatment as necessary for receipt by the Waste Isolation Pilot Plant (WIPP), and disposal of transuranic (TRU) classified sludge at WIPP. A more detailed description of the waste management process for sludge that is classified as TRU will be provided in the Removal Action Work Plan. A portion of the treated sludge may be acceptable for disposal at ERDF.

II. SITE CONDITIONS AND BACKGROUND

Radioactive sludge is currently stored in two water-filled basins within the 100-KR-2 Operable Unit at the USDOE's Hanford Site, 100 Area, EPA ID# WA3890090076. These basins have leaked to the environment in the past and as the basins continue to age, risks of additional leaks increase. Removal of the sludge in the K Basins is a precursor to completing the removal of over 2.6 million gallons of radiologically contaminated water used for radiation shielding and must be undertaken in order to prevent the sludge from drying and becoming dispersed to the air space of the basins and into the environment. Removal of the sludge from the basins is a critical step in risk reduction and was directed by the 1999 CERCLA ROD.

Upon removal from the basins, storage of the sludge is a challenge. In addition to being radioactive, the sludge releases hydrogen which poses risks during storage. Those risks can be reduced by treating the waste into a stable waste form.

Retrieval of sludge from the 105-K East Basin is scheduled in the near term. In lieu of transporting this sludge to interim storage in its current state and with its associated hazards, the NLOP sludge will be removed and treated. The treatment will yield a less hazardous and less mobile waste form; thereby obviating the more difficult and costly engineering and administrative controls that otherwise would be required to ensure safe storage. In addition, it will be packaged, stored temporarily at Hanford, and then shipped to WIPP for final disposal.

Sludge from the NLOP has a lower radioactivity than the remainder of the K Basins sludge. The NLOP sludge can be solidified and packaged for disposal to WIPP as contact-handled transuranic waste. Appropriate treatment of the remaining sludge has not been defined. WIPP currently has established waste acceptance criteria (WAC) and is available to receive contact-handled transuranic waste. WIPP is the only site in the country where transuranic waste can be disposed. WIPP has not yet established WAC for remote-handled waste. So while the NLOP sludge can be treated and disposed to WIPP, the remainder of the sludge cannot be disposed there at this time. The remainder of the sludge continues to be subject to the existing ROD requirement for removal and transport to the 200 Area for storage. However, in an April 29, 2004, Tentative Agreement, signed by DOE-RL and EPA, the parties agreed that the ROD will be modified to include treatment in order to prepare it for shipment to WIPP. Experience with treatment, management, and disposal of the NLOP sludge however should better enable treatment and disposal of the remaining sludge at WIPP, should disposal of remote-handled transuranic waste be authorized.

This action is consistent with the responses to public comments included in the ROD in which it was explained that viable opportunities to treat the sludge would be pursued to avoid interim storage. This action will require treatment, interim storage of treated sludge, and disposal that are beyond the scope of the existing ROD.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Conditions persist wherein threats to public health or welfare or the environment exist. These threats are caused by the continued storage of sludge in the unlined and aging K Basins. This TCRA reduces risks associated with storage of the NLOP sludge in its wet untreated form. This TCRA requires near-term disposal in deep underground caverns at WIPP which eliminates risks resulting from storage at Hanford.

The National Contingency Plan (NCP), 40 CFR, Section 300.415(b)(2), establishes factors to be considered in determining the appropriateness of a removal action. Those factors include:

Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release. The K Basins continue to store over 50 cubic meters of sludge and over 2.6 million gallons of radiologically contaminated water. The sludge contains hazardous substances including radionuclides and PCBs. Without this TCRA the sludge would be removed and stored as wet sludge in containers in T-Plant which would have an ongoing requirement to monitor the containers of waste and releases to the air. This

TCRA allows sludge to proceed directly to treatment to eliminate long-term storage of untreated NLOP sludge at T-Plant and its associated risks. The sooner sludge is treated and disposed at WIPP, the sooner the risk of release to the environment is abated.

An additional factor listed at 40 CFR 300.415(b)(2) is "*other situations or factors that may pose threats to public health or welfare of the United States or the environment*". Processing the sludge into a state where its physical properties have been changed to make it less of a hazard (e.g. generation of hydrogen) and less dispersible to the environment by the manner in which it will be packaged, reduces the threat of release. Continuing to store the sludge in its present state increases the risk of a release as time passes.

IV. ENDANGERMENT DETERMINATION

This TCRA is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, and contaminants into the environment from this site. Such a release may present an imminent and substantial endangerment to public health, welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

No exemptions from statutory spending limits are required. Statutory spending limits are not applicable at federal facilities.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

The proposed activities to be covered by this TCRA are the treatment, temporary storage, and disposal of NLOP sludge at WIPP. The parties intend that this removal action will be incorporated into a future ROD amendment that will also address the remaining K Basins sludge and removal of the contaminated K Basins. The parties are proposing this TCRA in advance of a ROD amendment in order to allow treatment of the NLOP sludge to proceed in lieu of storage scheduled to begin in the fourth quarter of fiscal year 2004. The proposed activities are consistent, to the extent practicable, with the anticipated final remedial action.

The selected Interim Remedial Action in the 1999 ROD for the 100-KR-2 Operable Unit calls for the K Basin sludge to be retrieved and transported to a 200 Area storage/treatment facility for long term storage. Programmatic reviews by DOE have determined that a different approach for the NLOP sludge is now more desirable. The new approach couples sludge retrieval and treatment activities, thereby accelerating the schedule for overall sludge processing and disposal. All Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) requirements for on-site actions are identified and discussed in Appendix A. The ARARs and TBCs in Appendix A include many that were identified in the 1999 ROD and additional ARARs and TBCs associated with on-site treatment and storage of the treated sludge. The TCRA will comply with all identified ARARs.

A slightly greater than one liter sample of NLOP sludge was collected in December 2003 for a bench scale treatability test to determine the optimal waste form for NLOP sludge suitable for disposal at WIPP. That test is described in *"Bench-Scale Test Plan to Demonstrate Production of WIPP-Acceptable KE NLOP Sludge Waste Forms at the 325 Building"* and *"Evaluation and Recommendation of Waste Form and Packaging for Disposition of the K East Basin North Loadout Pit Sludge, 46857 – RPT01"* which discusses the results of these tests and recommendations for treatment. That information is used for this TCRA. Treatment of the NLOP sludge in accordance with this TCRA will provide vital information to be used in deciding how to approach disposal of the rest of the K Basins Sludge. The remaining sludge will also need to undergo treatment and packaging, and experience with the NLOP sludge will help optimize that future activity.

The proposed action involving the NLOP Sludge will:

- Achieve near-term risk reduction
- Minimize handling requirements
- Eliminate risks associated with interim storage of sludge prior to treatment
- Accelerate treatment and packaging for disposal, and disposal of the treated sludge.

The NLOP contains approximately 5.2 to 6.2 cubic meters of sludge which represents about 12 percent of the total volume of K East Basin sludge. The NLOP sludge contains lower levels of radiological contaminants and metallic uranium than does the remaining 88 percent of the K East Basin sludge. This level of contamination will allow for the sludge to be managed as contact-handled radioactive waste instead of remote-handled radioactive waste. Using the As Low As Reasonably Achievable principles, the TCRA activities described herein achieves near term risk reduction and facilitates acquisition of information that will support overall K Basin sludge disposition.

Technical Approach

The NLOP Sludge will be retrieved into containers. Methods can consist of, but are not necessarily limited to, using the existing sludge water system and retrieving sludge into the large diameter containers (LDCs). The LDC will be contained within a shipping cask. Alternatively smaller quantities of sludge may be retrieved using systems which have been used in past sludge sampling campaigns.

Sludge will be transported to the Pacific Northwest National Laboratory 325 Building where it will be treated to meet WIPP contact-handled WAC, including elimination of free liquids and reduction of surface radiation dose. LDCs used to transport sludge may be reused for other shipments. It is anticipated that two to four LDCs will be needed to transport the sludge.

Secondary waste generated by this removal action, such as anti-contamination clothing, used LDCs, and other waste that meets or can be treated to meet the WAC for ERDF may be disposed at ERDF. If ERDF cannot be used, the EPA may approve use of the Central Waste Complex (CWC), Mixed Waste Trench (W-025), Low Level Burial Grounds, Waste Receiving and Processing facility, and T Plant as on-site environmentally protective management facilities for the debris provided this waste and these facilities are managed in accordance with applicable requirements. USDOE will submit a work plan for this TCRA to EPA for review and approval.

This work plan shall include the treatment and management standards for the facilities used to treat, manage, and dispose of this waste.

It appears that treatment by dewatering the sludge, grouting the sludge or solidifying the sludge with a polyacrylic sorbent will meet the CWC and WIPP WAC. Other solidification agents are being considered as well and may be used if approved by EPA. If used, these will follow the same treatment processes.

Once the NLOP sludge has been treated and containerized, the containers will be shipped to the CWC, where they will be temporarily stored. Following temporary storage at the CWC, the sludge will be transported to WIPP for disposal. A sufficient volume of solidification agents necessary to reduce the dose to WIPP's contact-handled criteria (200 mrem/h) may be added. As a result, it is understood that the TRU constituents will be diluted. Upon completion of solidification, the waste may no longer designate as TRU waste (i.e. at or below 100 nanocuries per gram) and may be acceptable for disposal at the Hanford Environmental Restoration Disposal Facility (ERDF). If the treated waste meets the ERDF WAC on-site disposal at ERDF is authorized provided the waste meets ERDF WAC. The approval does not authorize intentional dilution of sludge beyond that required to reduce dose to WIPP's contact-handled criteria in order to meet ERDF WAC.

Costs

The total estimated cost for this removal action is $5.9 Million. The cost is composed of the following components:

Treatment $3.0M
Temporary storage $1.1M
Certification $1.8M

Retrieval cost for the sludge was included in the 1999 ROD for the K Basins. Transportation and disposal costs for this action are included in the funding for WIPP rather than for the Hanford site. Both sludge retrieval cost and WIPP costs are not included in this cost estimate. The DOE is responsible for the cost for this TCRA, including the above identified costs, retrieval costs, and disposal costs.

VII. NEPA VALUES

In accordance with the Secretary of Energy's Policy Statement on the National Environmental Policy Act (NEPA), NEPA values have been incorporated into this TCRA to the extent practicable. Additional analysis of the NEPA values may be found in the September 30, 1999 Interim Remedial Action ROD for the 100-KR-2 Operable Unit, the Focused Feasibility Study for the K Basins Interim Remedial Action, (DOE/RL-98-66), and the K Basins environmental impact statement, *Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington, Addendum, Final Environmental Impact Statement.*

VIII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delay or disapproval of this proposed action will allow the potential for release of CERCLA hazardous substances into the environment and increases the risk of release to the environment exposure. Failure to act will increase/prolong the threats of environmental exposure.

IX. OUTSTANDING POLICY ISSUES

Attached as Appendix B, is a Toxic Substances Control Act Risk Based Disposal Approval that is a part of this TCRA. The treatment of the 105-KE Basin NLOP sludge at the 325 Building, is considered on-site for the purposes of this TCRA. This TCRA is subject to the permits for the treatment and waste management facilities used for this TCRA. All permits, plans, or documents that are associated with this activity are being reviewed and/or modified if necessary to support this activity. The basic requirements of the September 30, 1999 Interim Remedial Action ROD for the 100-KR-2 Operable Unit will be followed except as modified herein.

This document describes hazards of the NLOP sludge, and the associated threat of release. Therefore, in addition to serving as a TCRA action memorandum, this document also serves as the removal site evaluation, per 40 CFR 300.410.

X. AUTHORITIES' ROLES

The lead response agency for this decision is the USDOE. The EPA will review and comment on this action memorandum. Results of this removal action will be reviewed in accordance with the schedule established in the Hanford Federal Facility Agreement and Consent Order (HFFACO). This action will comply with state and federal applicable or relevant and appropriate requirements (ARARS).

XI. ENFORCEMENT

This TCRA will be conducted in accordance with the Hanford Federal Facility Agreement and Consent Order (HFFACO). Sludge retrieval will be followed by treatment as necessary for receipt by WIPP, and disposal of transuranic (TRU) classified sludge at WIPP. A more detailed description of the waste management process for sludge that is classified as TRU will be provided in the Removal Action Work Plan. A portion of the treated sludge may be acceptable for disposal at ERDF.

XII. CERCLA Section 104(d)(4) Determination

The preamble to the NCP indicates that when non-contiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such non-contiguous facilities without having to obtain a permit. The 100 K Area, the 325 Building in the 300 Area, and both CWC and ERDF in the 200 Area are treated as on site for response purposes for this action. These on site facilities are subject to their operating permits.

Lead response agency signature sheet for the Time Critical Removal Action for the treatment and disposal of sludge from the North Loadout Pit at USDOE Hanford Site, 100-KR-2 Operable Unit K Basins

Keith A. Klein Manager, Richland Operations Office United States Department of Energy	JUN 4 2004 Date

Concurrence signature sheet for the Time Critical Removal Action for the treatment and disposal of sludge from the North Loadout Pit at USDOE Hanford Site, 100-KR-2 Operable Unit K Basins

_______________________________ _______________

Kathryn Davidson — Date

Acting Director, Environmental Cleanup Office
United States Environmental Protection Agency, Region 10

FIGURE 1. LOCATION OF THE 100-K AREA WITHIN THE HANFORD SITE

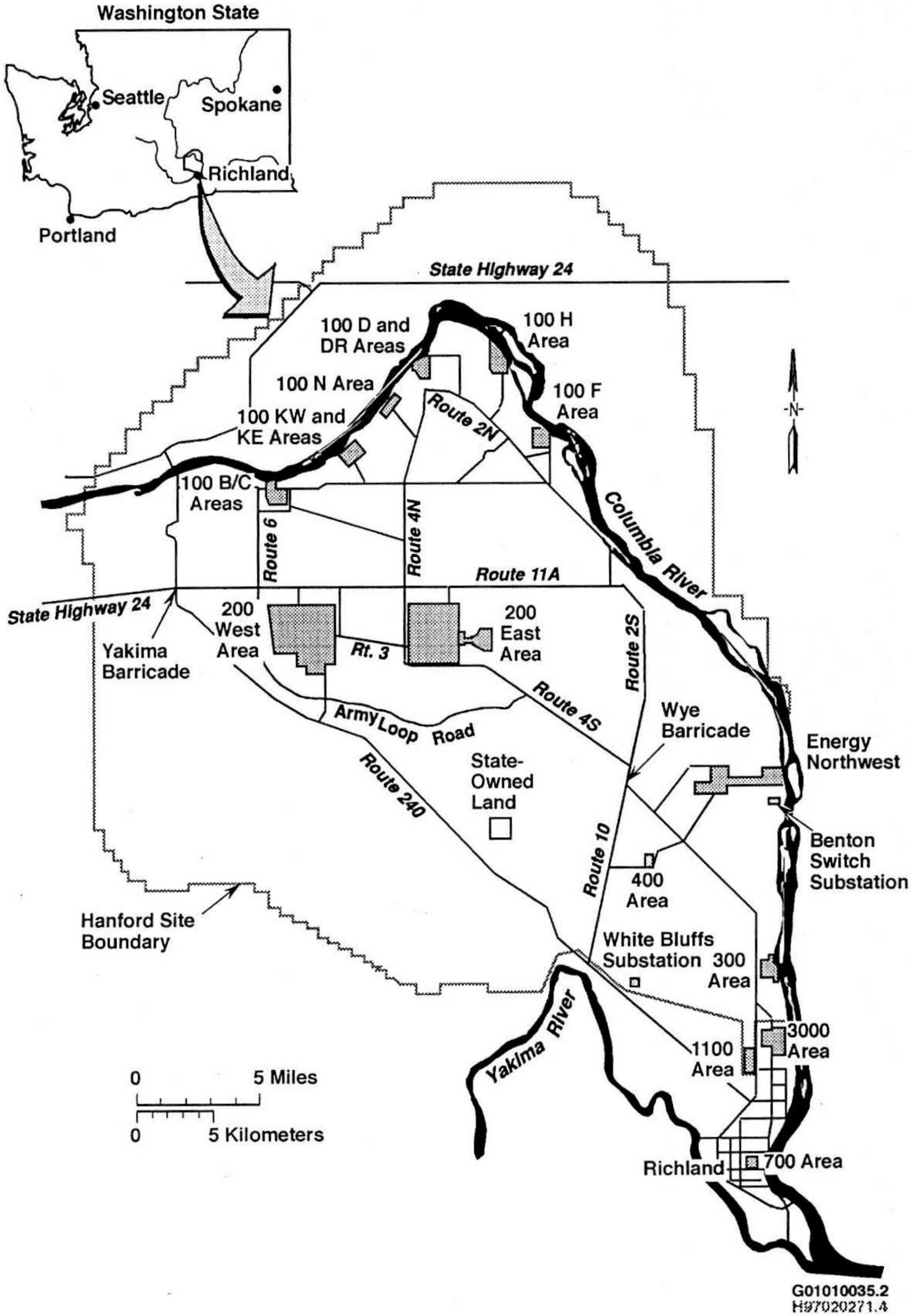
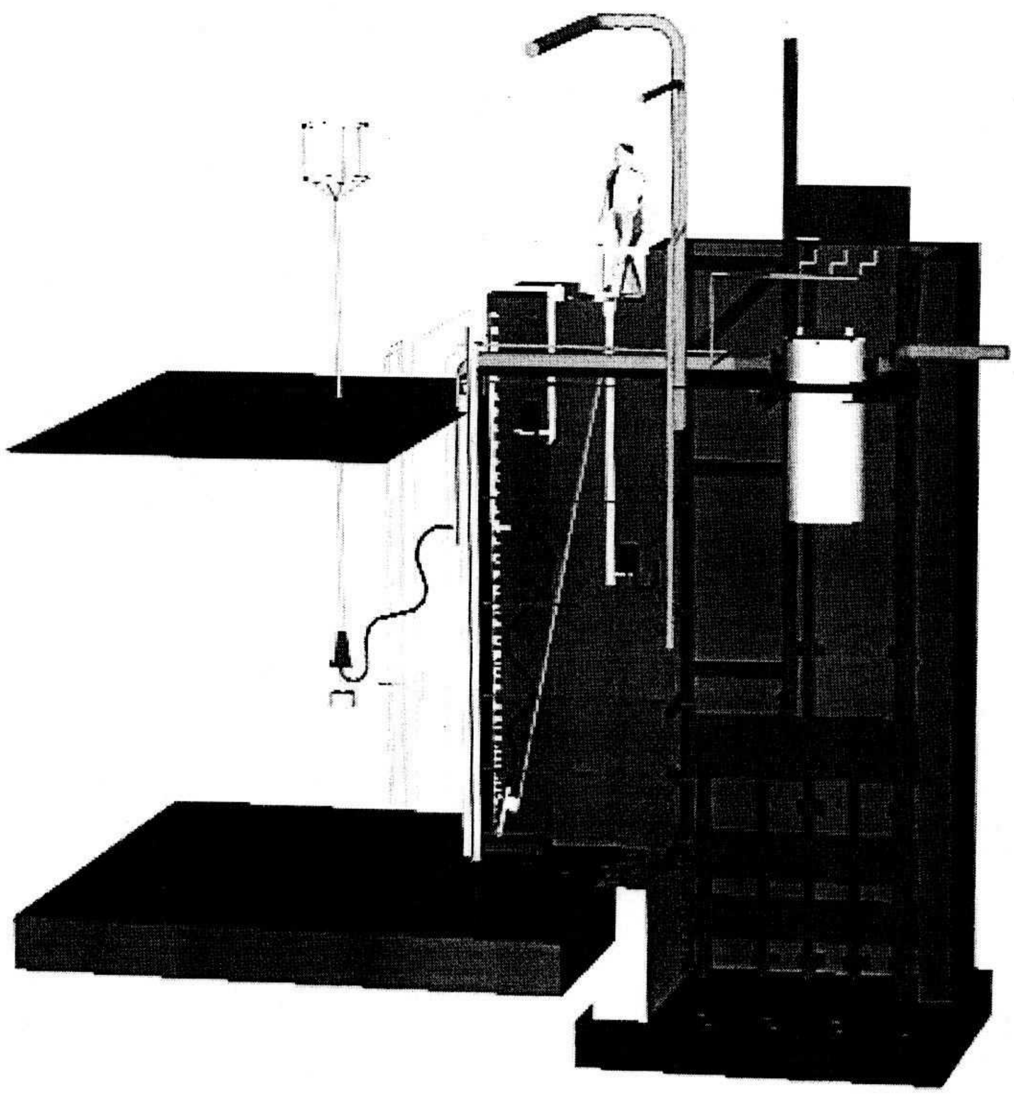


FIGURE 2 NORTH LOADOUT PIT



Appendix A – Applicable or Relevant and Appropriate Requirements

Under CERCLA Section 121, remedies must be protective of human health and the environment, comply with ARARs, be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. In addition, CERCLA includes a preference for remedies that employ treatment that significantly and permanently reduces the volume, toxicity, or mobility of hazardous substances as their principal element. This TCRA satisfies the CERCLA preference for treatment as a principal element.

This TCRA provides protection of human health and the environment by treating sludge to a stable waste form, packaging the treated waste in protective containers, providing safe temporary storage, and disposing in WIPP. WIPP is a deep geological repository designed specifically for TRU waste. This TCRA will be conducted in compliance with identified ARARs, to-be-considered (TBC) materials, and As Low As Reasonably Achievable (ALARA) principals to minimize exposure to site workers and releases to the environment.

This TCRA will comply with the federal and state ARARs and TBCs identified in Table A-1. No waiver of any ARAR is being sought. Since transportation is an "off-site" activity and not an "on-site" activity, it would not qualify as an ARAR.

Table A-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Information for105-K East North Loadout Pit (3 sheets).			
ARAR Citation	**ARAR or TBC**	**Requirement**	**Rationale for Use**
Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Provisions (40 CFR 761) Specific subsections: 40 CFR 761.50(b)(1) 40 CFR 761.50(b)(2) 40 CFR 761.50(b)(3) 40 CFR 761.50(b)(4) 40 CFR 761.50(b)(7) 40 CFR 761.50(c)	ARAR	These regulations establish standards for storage and disposal of PCB wastes.	These regulations are applicable to the storage and disposal of PCB liquids, items, remediation waste, and bulk product waste at ≥50 ppm. The specific identified subsections from 40 CFR 761.50(b) reference the specific sections for management of each PCB waste type. Radioactive PCB waste can be disposed in accordance with 40 CFR 761.50(b)(7).
Department of Energy Occupational Radiation Protection (10 CFR 835)	ARAR	This regulation establishes occupational dose limits for adults.	Substantive requirements of this regulation are applicable to removal actions performed at the site in which there is potential exposure to ionizing radiation and/or radiological contamination.
Radiation Protection - Air Emissions (WAC 246-247) Specific subsections: WAC 246-247-120 WAC 246-247-130	ARAR	These regulations establish limits for airborne radionuclide emissions as defined in WAC 173-480 and 40 CFR 61 Subpart H.. The ambient air standards under WAC 173-480 require that the most stringent standard be enforced. Ambient air standards under 40 CFR 61 Subpart H are not to be exceeded in amounts that result in an effective dose equivalent of 10 mrem/yr to any member of the public. These standards specify emission monitoring requirements and the application of best available radionuclide technology requirements.	These regulations are applicable because they set emission limits and use of best available radionuclide control technology or as low as reasonable achievable control technology for airborne radionuclide emissions.

Table A-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Information for105-K East North Loadout Pit (3 sheets).			
ARAR Citation	**ARAR or TBC**	**Requirement**	**Rationale for Use**
National Emission Standards for Hazardous Air Pollutants (40 CFR 61) Specific subsections: 40 CFR 61.01 40 CFR 61.05 40 CFR 61.12 40 CFR 61.14 40 CFR 61.92	ARAR	These regulations establish emission standards for hazardous air pollutants including radionuclides (except radon). These regulations provide general requirements and listings for regulated emissions at a regulated facility. 40 CFR 61.92 sets limits for emissions of radionuclides from the entire facility to ambient air. Radionuclide emissions can not exceed those amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr. The definition of facility as applied at Hanford means the entire Hanford site.	These regulations are applicable to the Hanford Site because there is potential to emit radionuclides to unrestricted areas. Radionuclide emissions from activities associated with the removal action must be controlled and monitored.
Ambient Air Quality Standards and Emission Limits for Radionuclides, (WAC 173-480) Specific subsections: WAC 173-480-040 WAC 173-480-050 WAC 173-480-060	ARAR	These requirements establish that the most stringent federal or state ambient air quality standard for radionuclides be enforced. The WAC 173-480 standard defines the maximum allowable level for radionuclides in the ambient air, which shall not cause a maximum accumulated dose equivalent of 25 mrem/yr to the whole body or 75 mrem/yr to any critical organ. However, ambient air standards under 40 CFR 61 Subpart H, are not to exceed amounts that result in an effective dose equivalent of 10 mrem/yr to any member of the public. Emission standards for new and modified emission units shall utilize best available radionuclide control technology.	Substantive requirements of this standard are relevant and appropriate to removal actions performed at the site that could emit radionuclides to the air.
Environmental Restoration Disposal Facility Waste Acceptance Criteria (BHI-00139)	TBC	This document establishes waste acceptance criteria for the Environmental Restoration Disposal Facility	Waste destined for management at ERDF must meet acceptance criteria to ensure proper disposal.

Table A-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Information for105-K East North Loadout Pit (3 sheets).			
ARAR Citation	**ARAR or TBC**	**Requirement**	**Rationale for Use**
The Hanford Site Solid Waste Acceptance Criteria (HNF-EP-0063)	TBC	This document establishes waste acceptance criteria for the Central Waste Complex.	Waste destined for management at CWC must meet acceptance criteria to ensure proper disposal.
Radiation Protection of the Public and the Environment DOE Order 5400.5	TBC	The order contains information on dose limits to the public and environment.	This order assists in establishing public dose limits for radiation and is consistent with NRC rules for radiation protection of the public and environment.

Appendix B

Toxic Substances Control Act
Risk-Based Disposal Approval
North Loadout Pit Sludge

This risk-based disposal approval (RBDA) is for the purpose of demonstrating the negligible risks to human health and the environment associated with the management of sludge from the 105-KE North Loadout Pit (NLOP) which is designated as polychlorinated biphenyl (PCB) remediation waste. This disposal approval has been proposed consistent with 40 Code of Federal Regulations (CFR) 761.61(c). The Department of Energy (DOE) has determined that the sludge is PCB remediation waste and is also transuranic (TRU) waste due to the amount and type of radionuclides in the sludge. The DOE plans to solidify the sludge and some free-standing water associated with the sludge to meet the Central Waste Complex (CWC) and Waste Isolation Pilot Plant (WIPP) waste acceptance criteria (WAC). In addition, residual waste remaining in the Large Diameter Containers (LDCs) used to transport the sludge will be solidified within the LDCs. Grouting of the LDCs is required to address void spaces to meet disposal requirements. Treatment might result in a waste form that meets criteria for disposal at an onsite facility (e.g. Environmental Restoration Disposal Facility (ERDF)). If the waste form meets the onsite facility WAC, then the waste will be disposed at that onsite facility.

Regulations governing the management and disposal of PCBs under the *Toxic Substances Control Act* (TSCA) are in Title 40 CFR Part 761. The NLOP sludge is a multi-phasic waste as described in 40 CFR 761.71(b)(4), it has both a solid and liquid phase. Any person disposing of multi-phasic mixtures must use the PCB disposal requirements that apply to the individual phase with the highest PCB concentration. See 40 CFR 761.71(b)(4)(iv). The U.S. Environmental Protection Agency (EPA) guidance explains that when disposing of multi-phasic waste, both phases shall be managed for disposal in a manner that assumes both phases contain PCBs. For example, even though PCBs have not been found in the liquid phase of the sludge using test methods with a detection limit of 0.5 ppb, the liquid phase is still treated as if it contains PCBs. The prescribed method of disposing of PCB remediation waste liquids is incineration. This RBDA demonstrates that the risks associated with managing the liquid phase for disposal by grouting are within acceptable levels.

This RBDA allows solidification of the aqueous portion of the multi-phasic NLOP sludge along with the solids portion. [The nominal volume of the as-settled NLOP sludge is 6.30 m^3. The average water content is 87 volume percent. The nominal PCB concentration is 9.41×10^{-5} g/cm^3.] The PCB treatment for the sludge is incidental to the treatment needed to meet other requirements. The demonstration that the PCBs do not present an unreasonable risk is based on the following points:

- The concentration and total mass of PCBs in the sludge are low. The risks associated with worst-case scenarios of releasing PCBs to the environment are low.

- The treated sludge will require safe storage and long-term isolation because of the highly radioactive contaminants, regardless of residual PCB contamination. Disposal options for TRU waste are limited.

- The aqueous portion is less than 0.5 ppb PCB and is used for shielding and contamination control. At this PCB concentration, the aqueous portion of the waste, if separated from the sludge, would be unrestricted under TSCA with regard to disposal or reuse. A one liter sample of the waste produced 360 millirem/hour (mrem/hr) with the water shielding. Removal of the water would increase the radiation exposure significantly. The annual Hanford administrative radiation exposure limit is 500 mrem.

- As additional water must be added to the sludge to complete the solidification process, removal of the aqueous phase would result in additional exposure and high dose rates for workers and increased potential for spread of radioactive contamination.

The PCB remediation waste (untreated sludge and/or treatment residuals) will be stored at the Hanford Site in containers designed for storage of radioactive waste. Storage areas will meet the requirements of 761.65(b).

In addition, this RBDA allows treatment of the LDC containers prior to disposal. The LDCs are stainless steel cylinders with nominal outside diameter of 1.5 m (5-ft) and a maximum height of 3 m (10-ft). Each LDC is loaded with approximately 2 m^3 of sludge. Up to four LDCs will be used to transfer the NLOP sludge. The LDCs will be emptied to the extent practicable. However, it is expected that up to approximately 180 kgs (400 pounds) of sludge could remain in each LDC after transfer of the contents for processing. Internal filter assemblies, consisting of fifty-five 5-micron cartridge filters, trap solids within the LDC. The majority of residual sludge is expected to be located in these filters. Processing of the LDCs consists of grouting the void space to meet disposal requirements. This processing will take place in the Hanford 200 Area near the intended disposal unit.

This RBDA demonstrates that if the PCBs in the sludge were not controlled and all the PCBs were released to the environment there would be an acceptable level of risk. Attached are calculations of the risk to an industrial worker in the vicinity of the processing unit, a recreation area on the river near the processing unit, and the closest residence to the unit. This bounding calculation assumes that sludge treatment occurs in the 325 building in the 300 Area and in the most conservative model assuming that all of the PCBs are volatilized with no treatment of the off-gas.

The concentration of the PCBs in the sludge is low, 9.41×10^{-5} g/cm^3. PCBs remaining in the sludge after treatment will be managed in a protective manner as the treated sludge will be a highly radioactive waste and managed accordingly. All exposure scenarios calculated show an additional cancer risk of less than 10^{-6}. The three scenarios evaluated for exposure, industrial, recreational, and residential, show additional cancer risks of 2.71×10^{-9}, 3.52×10^{-10}, and 1.89×10^{-8} respectively. In addition all scenarios are less than the state acceptable source impact level of 4.5×10^{-3} ug/m^3 (WAC 173-460-150). Therefore, even if all of the PCBs were emitted to the environment, risks would be within the EPA acceptable risk range.

Impacts of residual material left in the LDCs (estimated at less than 730 kg of sludge held up on the filters of four LDCs) are bounded by the evaluation already performed for the 325 building (i.e., less than 10 percent of the source material is available for release). Because the 200 Area is more remote than the 300 Area, and the residual material is confined and less amenable to release, risks to human health and the environment for 200 Area operations are much lower than those calculated for the 300 Area. Therefore, risks associated with processing of the empty LDCs are less than the EPA acceptable risk range.

Based on this information, it can be concluded that the PCBs do not present an unreasonable risk to human health and the environment. Any of the sludge treatment alternatives identified would be protective of human health and the environment with respect to PCBs. Therefore, the sludge treatment performed would satisfy the requirements of 761.61(c) to "not pose an unreasonable risk of injury to health or the environment".

Attachment
to
Appendix B: Toxic Substances Control Act
Risk-Based Disposal Approval
North Loadout Pit Sludge

Attachment

Toxic Substances Control Act
Risk-Based Disposal Approval
North Loadout Pit Sludge

Problem:

The sludge from K Basins contains PCBs that could volatilize during treatment. Determine the concentrations of PCBs that may occur in the air stream exiting the 325 Building stack and the maximum concentrations that would be observed within the 300 Area fenceline, near the 300 Area shoreline, and at the nearest residence.

Note that PCBs have very low vapor pressures and adsorb strongly to soil and plastic. Complete volatilization is very conservative. There is no mechanism to drive volatilization. Sludge is mixed with water and binding agents and allowed to solidify. PCBs are then bound in the matrix of the solid material.

Given:

1) North Loadout Pit nominal volume of as-settled sludge = 6.3 m^3 (Pearce 1998).
2) PCB concentration = 0.0000941 gm/ cm^3 settled sludge (Pearce 1998).
3) Air flow through ventilation system = 143,000 scfm (CY 2003 average) = 67.5 m^3/s
4) All sludge is assumed to be processed in one year, with complete volatilization of PCBs

Solution:

The annual average concentration of PCBs that may occur in the air stream exiting the 325 Building stack (325-EP-01-S) is determined by arithmetic calculations using conversion factors. The maximum concentrations within the 300 Area fenceline, near the 300 Area shoreline, and at the nearest residence are determined using the EPA air dispersion model Screen3 available on the Internet.

Results:

Annual Average Concentration of PCBs in Air Stream Exiting the 325 Building Stack (EP-325-01-S):

$$\frac{\text{Total available PCBs released from 6.3 m}^3\text{ of NLOP sludge at 9.41 E-5 g/cm}^3}{\text{All sludge treated in one year (flow rate x number of seconds/yr)}}$$

$$= \frac{(6.3\ m^3/yr)(9.41\ E\text{-}5\ g/cm^3)(10^6\ cm^3/m^3)(10^6\ \mu g/g)}{(67.5 m^3/s)(3600\ s/hr)(24\ hr/d)(365\ d/yr)} = 2.79\ E\text{-}1\ \mu g/m^3$$

Maximum Concentration of Airborne PCBs in the 300 Area and at the 300 Area shoreline from the EPA Screen3 Air Dispersion Model:

Assumptions:

1) Point source of air emissions

2) Emission rate = 0.0000188 g/s from the following equation:

$$\frac{\text{Total available PCBs released from 6.3 m}^3\text{ of NLOP sludge at 9.41 E-5 g/cm}^3}{\text{All sludge treated in one year (number of seconds/yr)}}$$

$$= \frac{(6.3\ m^3/yr)(9.41\ E\text{-}5\ g/cm^3)\ (10^6\ cm^3/m^3)}{(3600\ s/hr)(24\ hr/d)(365\ d/yr)} = 1.88\ E\text{-}5\ g/s$$

3) Stack height - 27.1 m

4) Stack inside diameter - 2.44 m

5) Stack exit velocity: (Input: "VM=67.5" for 67.5 m^3/s)

6) Ambient temperature = 293 degrees Kelvin (20 degrees Centigrade)

7) Stack gas exit temperature = range 295 to 300 degrees Kelvin (72-80°F); 72° F yielded most conservative results

8) Receptor height above ground = 1.8 meters

9) Both 'Urban and Rural parameters modeled; Area considered 'Urban' (50% or more of area contains buildings separated by open space) yielded most conservative results

10) Consider building downwash in calculations (building height = 12 m, minimum horizontal building dimension = 83 m, maximum horizontal building dimension = 104 m)

11) No complex terrain; no terrain above stack base

12) Full meteorology (per Screen3 users guide recommendations)

13) Screen automated distances, 50 m to 1500 m
Consider discrete distances for Screen3 modeling:
Distance from stack to 300 Area nearest fenceline: 325 meters
Distance from stack to nearest shoreline: 603 meters

EPA Screen 3 Air Dispersion Model results

- Maximum PCB concentration at ground level (breathing zone) within 300 Area fence (less than 325 meters from EP-325-01-S, Table 1): 3.63 E-4 $\mu g/m^3$

- Maximum PCB concentration in ambient air near 300 Area shoreline (603 meters from EP-325-01-S, see Table 1): 6.29 E-4 $\mu g/m^3$.

- Maximum PCB concentration at ground level (breathing zone) at nearest residence (1400 meters from EP-325-01-S, Table 1): 3.86 E-4 $\mu g/m^3$

- Acceptable Source Impact Level (WAC 173-460-150) for PCBs is 4.5 E-3 $\mu g/m^3$.

Risk Calculations

Incremental cancer risk from exposure to PCB air emissions was evaluated for three scenarios (Table 2)

1. A worker inside the 300 Area (325 m to the nearest fence), exposed for 250 days/year, 8 hrs/day, for 20 years
2. Public recreational exposure near the Columbia River, at 100 days/ year, 1 hr/day, for 30 years
3. Public residential exposure at 365 days/yr, 24 hrs/day, for 30 years

Risk is estimated by multiplying EPA factors in the following formula:

Risk = (CPF * CONC*IH*EF*ED)/(BW*AT*UCF1*UCF2),

Where,

CPF	= Cancer potency slope factor, kg-day/mg (from www.epa.gov/iris/)
CONC	= Maximum concentration of PCBs in ambient air, $\mu g/m^3$
IH	= Inhalation rate, 20 $m^{3/}$day
EF	= Exposure frequency in days
ED	= Exposure duration, 20 years industrial, 30 years recreational or public (note that exposure duration is extremely conservative, as project is expected to take about a year
BW	= body weight, 70 kg
AT	= Averaging time, 70 yrs
UCF1	= Units conversion factor, µg to mg
UCF2	= Units conversion factor, days per year

All three scenarios had estimated risk that was more protective than the most protective end of the acceptable risk range within the NCP.

Table 1

Screen3 Air Dispersion Modeling Results PCB Concentration in Ambient Air with Various Stack Parameters.

Distance from Stack, meters	Urban Model		Rural Model	
	27.1 m Stack; 72° F PCBs in Air μg/m³	27.1 m Stack; 80° F PCBs in Air μg/m³	27.1 m Stack; 72° F PCBs in Air μg/m³	27.1 m Stack; 80° F PCBs in Air μg/m³
50	9.80 E-5	9.84 E-5	1.66 E-4	1.67 E-4
100	2.67 E-4	2.67 E-4	2.95 E-4	2.96 E-4
200	3.63 E-4	3.63 E-4	2.67 E-4	2.68 E-4
300	3.40 E-4	3.40 E-4	2.49 E-4	2.49 E-4
325[a]	3.39 E-4	3.39 E-4	2.49 E-4	2.49 E-4
400	4.61 E-4	3.21 E-4	2.41 E-4	2.41 E-4
500	5.86 E-4	3.48 E-4	2.28 E-4	2.28 E-4
600	6.27 E-4	4.13 E-4	2.31 E-4	2.31 E-4
603[b]	6.28 E-4	4.14 E-4	2.31 E-4	2.31 E-4
700	6.21 E-4	4.40 E-4	2.27 E-4	2.27 E-4
800	5.93 E-4	4.43 E-4	2.21 E-4	2.21 E-4
900	5.57 E-4	4.33 E-4	2.12 E-4	2.12 E-4
1,000	5.18 E-4	4.16 E-4	2.03 E-4	2.03 E-4
1,100	4.81 E-4	3.96 E-4	1.98 E-4	1.93 E-4
1,200	4.46 E-4	3.75 E-4	2.24 E-4	1.87 E-4
1,300	4.14 E-4	3.54 E-4	2.47 E-4	1.79 E-4
1,400[c]	3.86 E-4	3.34 E-4	2.66 E-4	1.70 E-4
1,500	3.60 E-4	3.16 E-4	2.82 E-4	1.64 E-4
Max Concentration > 50 m	6.29 E-4 630 m	4.44 E-4 767 m	3.41 E-4 120 m	3.42 E-4 120 m

[a] Distance to nearest fenceline in 300 Area
[b] Distance to the Columbia River shoreline
[c] Distance to nearest residence.
Shaded concentrations are maximum concentrations in reasonable worst-case exposure scenarios.

Table 2

Calculation of Incremental Cancer Risk for Processing Sludge at the 325 Building.

Incremental cancer risk from exposure to PCB air emissions in an industrial scenario:		
Risk =-(CPF*CONC*IH*EF*ED)/(BW*AT*UCF1*UCF2)		
Variable	Value	Description
CPF	0.4	Cancer potency slope factor, kg-day/mg (from www.epa.gov/iris/)
CONC	3.63 E-4	Max. conc. of PCBs in ambient air, micrograms/cubic meter, from 27.1 m stack worker exposure inside fence (Table 1)
IH	20	Inhalation rate, cubic meters per day
EF	83.33	Exposure frequency, days (250 days per year, 8/24 hrs/day)
ED	20	Exposure duration, years (specific to industrial exposure scenario
BW	70	Body weight, kg
AT	70	Averaging time, years
UCF1	1,000	Units conversion factor, micrograms per milligram
UCF2	365	Units conversion factor, days per year
Incremental Cancer Risk = **2.71 E-09**		
Incremental cancer risk from exposure to PCB air emissions in a recreational scenario:		
Risk =-(CPF*CONC*IH*EF*ED)/(BW*AT*UCF1*UCF2)		
CPF	0.4	Cancer potency slope factor, kg-day/mg (from www.epa.gov/iris/)
CONC	6.29 E-4	Conc. of PCBs in ambient air, micrograms/cubic meter, at Columbia River (Table 1)
IH	20	Inhalation rate, cubic meters per day
EF	4.17	Exposure frequency, days (100 days per year, 1/24 hrs/day)
ED	30	Exposure duration, years (specific to exposure scenario)
BW	70	Body weight, kg
AT	70	Averaging time, years
UCF1	1,000	Units conversion factor, micrograms per milligram
UCF2	365	Units conversion factor, days per year
Incremental Cancer Risk = **3.52 E-10**		
Incremental cancer risk from exposure to PCB air emissions at nearest residence:		
Risk =-(CPF*CONC*IH*EF*ED)/(BW*AT*UCF1*UCF2)		
CPF	0.4	Cancer potency slope factor, kg-day/mg (from www.epa.gov/iris/)
CONC	3.86 E-4	Conc. of PCBs in ambient air, micrograms/cubic meter, at nearest residence (Table 1)
IH	20	Inhalation rate, cubic meters per day
EF	365	Exposure frequency, days (365 days per year, 24 hrs/day)
ED	30	Exposure duration, years (specific to exposure scenario)
BW	70	Body weight, kg
AT	70	Averaging time, years
UCF1	1,000	Units conversion factor, micrograms per milligram
UCF2	365	Units conversion factor, days per year
Incremental Cancer Risk = **1.89 E-08**		